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Obtaining, Seasoning & Burning Wood: Part One in a Series on Wood as a Fuel Source

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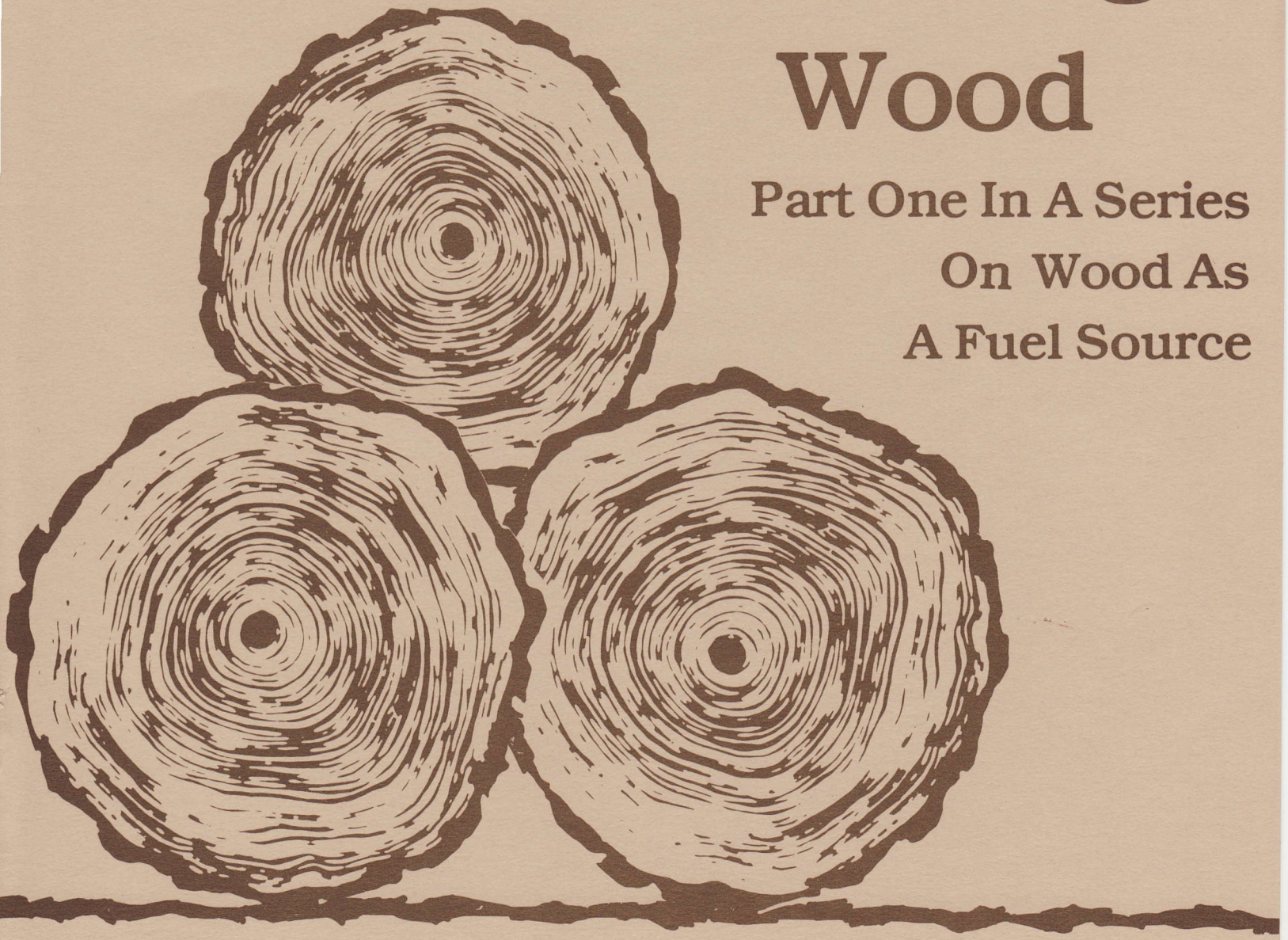
AEES—18

Obtaining, Seasoning & Burning Wood

Part One In A Series On Wood As A Fuel Source



UNIVERSITY OF KENTUCKY · COLLEGE OF AGRICULTURE · COOPERATIVE EXTENSION SERVICE
Agriculture · Home Economics · 4-H · Development

Obtaining, Seasoning & Burning Wood

Part One In A Series On Wood As A Fuel Source

INTRODUCTION

Heating with wood has become increasingly popular in Kentucky because firewood is a renewable energy source which, when used properly, is relatively clean, efficient and safe. A wood heating system can reduce fuel costs, supplement other heating sources and provide aesthetic appeal.

However, there are several aspects of using wood as a fuel which are very different from using our fossil fuel sources. Unlike fuel oil, for example, which shows very little variation from one gallon to the next, in terms of energy content and burning properties, wood shows a great deal of variability in these characteristics. The type, moisture content, coaling quality and many other factors of the wood all influence the amount of heat given off by a fire. Besides the burning characteristics, there are differences in the way in which wood is obtained, stored and handled.

Many people who are considering wood as a heat source may have limited or no experience in its use. The following information should be helpful in determining what kind of wood to use, where to get it, how to store it and how to burn it.

Obtaining Wood

Firewood can be obtained from a variety of sources. Owning your own woodlot is the least expensive of these sources. An average woodlot yields one-half cord per acre per year. However, because a truck and personal effort is required, some people may find this solution to be impractical.

Dumps and landfills in your town or county may provide a good source because many town ordinances prohibit burning. Almost 30 percent of the debris may be usable wood fiber. Also, construction sites and sawmills often offer good scrap materials.

Another firewood source is forested land owned by the State and Federal Governments. The U.S. Forest Service issues free permits for persons to cut on designated areas of national forest land such as the Daniel Boone National Forest in Kentucky.

While each of these sources may have a plentiful supply of firewood, be sure to obtain permission before cutting or removing wood from property other than your own and comply with the owner's wishes.

If owning a woodlot is impractical and firewood cannot be obtained without cost as outlined above, it may be purchased from firewood dealers. Firewood is traditionally sold by the standard cord. A cord measures 8 feet long, 4 feet high and 4 feet wide (Figure 1). Its total volume is 128 cubic feet. Be sure that the seller explains what standard of measurement he uses in selling firewood. Smaller units of measurement called by the names face cord, short cord or rick measure 8 feet long, 4 feet high and 1 to 2 feet wide. Remember that a cord cut in shorter lengths will require less space to store because many of the crooks are eliminated.

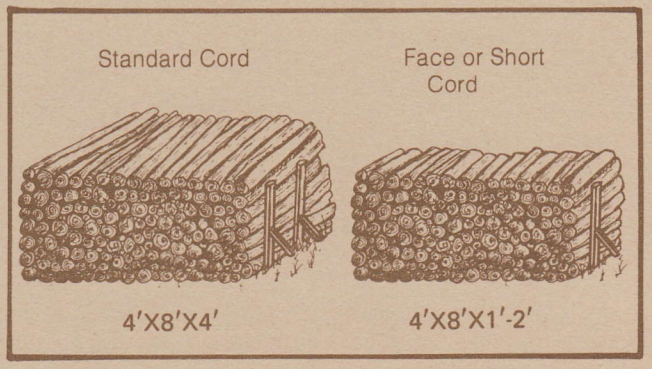


Figure 1. Measurement Units

Firewood may also be purchased by the truck load. Of course, the price will vary considerably according to the truck size. Another way to buy wood is by weight. If you choose this method keep in mind that a cord of green wood will shrink at least 8 percent in volume and 20 percent in weight during seasoning. A green wood cord weighs 800-1400 lbs. more than dry wood. Consequently, if bought by weight, the driest wood available gives 20 percent higher heat value for the money.

Comparing Wood Types

Some types of wood are worth more than others on a per cord basis due to a greater heat content and better burning qualities. In addition to the heat content, the following characteristics are important when considering the type of wood to burn: (1) ease of splitting, (2) ease of starting, (3) extent of smoking, (4) extent of sparking and (5) coaling qualities. Table 1 lists the characteristics of commonly used fuelwoods.

Short lengths of straight-grained, knot-free wood will split easily. Sometimes frozen wood splits easily. Softwoods, being resinous, are easy to ignite, and burn rapidly with a high, hot flame. However, they burn out quickly and require frequent attention. Hardwoods are generally more difficult to ignite, burn less vigorously and with a shorter flame. However, they last longer and produce more coals than softwoods.

Some woods burn more cleanly than others. A high resin content as well as a high moisture content can lead to a smoky fire, which increases creosote and soot problems in the flue. Most softwoods are noted for putting out more smoke, and any green unseasoned wood can be a smoke problem.

Some resinous softwoods contain moisture pockets which can be troublesome. When heated, trapped gases and water vapor build up pressure resulting in "pops" which throw sparks. Reducing the wood's moisture is one way to control sparking.

The coaling quality of wood is important in the ability of a stove to put out heat overnight and influences the frequency of stoking the fire. In general, the dense hardwoods are superior in forming long lasting coals.

Cutting, Seasoning and Storing

It has already been pointed out that the best heat value is derived from heavy, seasoned wood. Cutting, seasoning and storing are important steps toward achieving higher heating value. Cutting wood to the desired burning lengths before stacking exposes more ends to the air and results in faster drying. Splitting these lengths will cause even faster drying. If a tree is cut in summer, let it lie for a full week before limbing so the leaves can help draw out the moisture.

Air-drying wood for six to eight months after

Quality Characteristics of Commonly Burned Woods

Species	Easy to Split	Ease of Starting	Heavy Smoke	Sparks	Coaling Qualities	Heat Value Per Cord (Million BTU)	
						Green	12% Moisture
Apple	yes	poor	no	few	excellent	23.5	32.0
Ash	yes	fair	no	few	good	26.0	28.3
Beech	no	poor	no	few	good	24.0	30.6
Birch (white)	yes	good	no	moderate	good	27.1	31.1
Cherry	yes	poor	no	few	excellent	20.0	23.8
Cedar	yes	excellent	yes	many	poor	16.4	22.4
Hemlock	yes	good	medium	many	poor	22.2	19.0
Hickory	yes	fair	no	moderate	excellent	29.0	35.3
Locusts (black)	no	poor	no	very few	excellent	25.8	32.6
Maple (sugar)	yes	poor	no	few	excellent	27.4	30.4
Oak (red)	yes	poor	no	few	excellent	27.5	30.4
Pine (white)	yes	excellent	medium	moderate	poor	17.3	18.1
Willow	yes	fair	no	few	poor	12.2	17.7

Table 1.

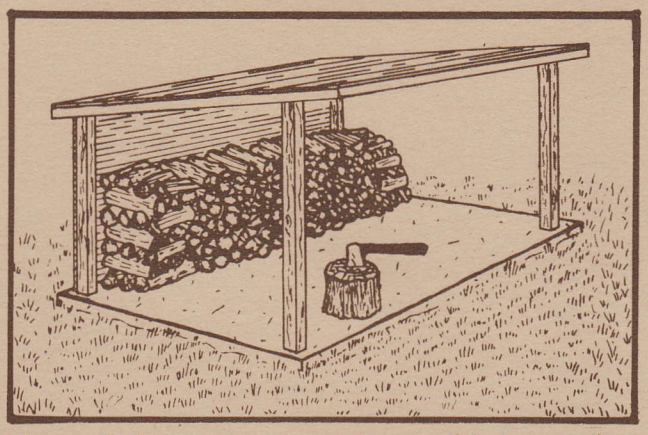


Figure 2. Store wood outdoors with protection to keep it dry and retain its fuel value.

cutting lowers the moisture content to 15-20 percent by weight. Stack the wood in loose piles that are raised above the ground for good circulation and better seasoning.

Firewood should be stored outdoors with partial or full protection to keep it dry and retain its fuel value. It can be stored in a woodshed, utility building or under sheet metal roofing (Figure 2). The area should be kept clear of weeds, leaves and debris to discourage rodents, snakes and insects from making their homes in the wood.

The Burning Process

A wood fire is easy to start and produces a large quantity of heat in a short time, as well as adding a cheerful atmosphere to the home. The process by which this heat is supplied is called burning, or combustion. Combustion transforms wood into heat, chemicals and gases. It is caused by the chemical combination of hydrogen and carbon in the fuel with oxygen in the air. It is important that ample air is supplied to a wood fire to assure complete burning or combustible gases. The complete combustion process produces water vapor and carbon dioxide along with heat and non-combustible gases.

The first phase of combustion heats the wood and evaporates all residual moisture (Figure 3). The second phase of combustion occurs at approximately 500 degrees F when the wood breaks down chemically and the volatile matter is vaporized. These vapors contain 50-60 percent of the wood's heating value. The gases burst into flames and burn at approximately 1,100 degrees F. The third stage of combustion is the remaining material, charcoal, burning at temperatures which exceed 1,100 degrees F.

For maximum efficiency during combustion, all volatiles must be mixed with air and kept at high temperatures to burn completely inside the heating area. A long flame path is needed to utilize the heat from the burning gases. If the path is not available, some of the volatile gases escape through the chimney. Air must be supplied in the proper proportions and quantity to achieve maximum efficiency, also. An air tight stove is an example of a burning unit which controls the amount of air so that efficiency will be increased.

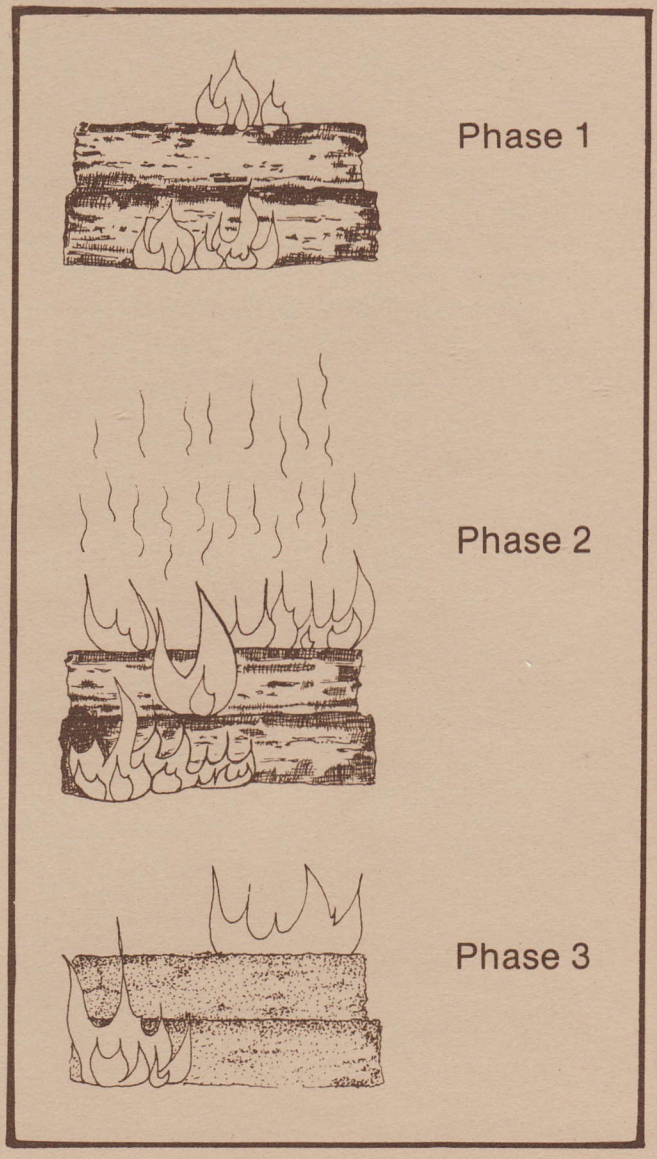


Figure 3. Stages of Combustion.

Creosote and Soot

When wood burns, the combustion process is never absolutely complete. With fires that burn below 1,100 degrees F volatile gases escape and condense on cooler surfaces. Creosote is a substance carried by the smoke and is quite fluid at very low temperatures. As creosote deposits are warmed they form a sticky, tar-like substance that can ignite and cause dangerous chimney fires.

Creosote problems may be reduced by providing ample oxygen circulation in the stove. Such circulation allows more heat to escape which in turn heats the exterior chimney, preventing creosote build-up. Unfortunately, this reduces the efficiency of the heating system.

The likelihood of creosote buildup and a chimney fire can be greatly reduced by burning only well-seasoned hardwood which has been air-dried at least six months. Green or wet wood should not be burned and softwoods with high resin content should be avoided. Smoldering fires also produce large amounts of unburned creosote.

Periodic cleaning of chimneys after inspection for excessive soot and creosote can help prevent chimney fires. Soot deposits can be removed by pulling a weighted, tightly fitted sack of straw or a bundled-up tire chain up and down the flue. Stiff wire chimney cleaning brushes are used by professional chimney sweeps and are available to the public. Creosote deposits can also be chipped from the masonry, but be careful not to knock out mortar joints or damage the flue lining.

Summary

Wood as a fuel differs greatly from the fossil fuels most of us are accustomed to using. There are several special considerations which a person needs to be aware of when choosing, storing and burning wood. Knowing the best types of wood to burn, how the wood should be seasoned and stored and what is involved in the burning process are important steps toward using wood efficiently and safely.

by Kathy Collier, Extension Assistant, and Larry Turner, Extension Agricultural Engineer

Which Wood Burns Best?

Beech wood fires are bright and clear
If the logs are kept a year.
Chestnuts only good, they say,
If for long it's laid away.
Birch and pine logs burn too fast
Blaze up bright and do not last.
Elm wood burns like a church yard mold,
Ev'n the very flames are cold.
Poplar gives a bitter smoke.
Fills your eyes and makes you choke.
Apple wood will scent your room,
With incense like perfume.
Oak and maple, if dry and old,
Keep away the winter cold.
But ash wood wet and ash wood dry
A king shall warm his slippers by.

— Anonymous

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